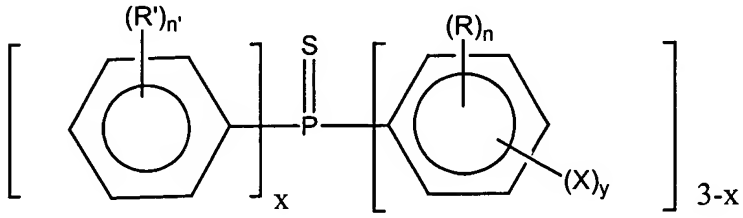
CLAIMS

1. A polymerizable composition comprising:

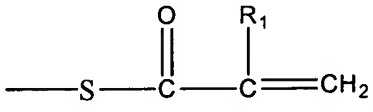
a) at least one first polymerizable component further defined as a monomer having at least two functional groups, the functional groups further defined as cyanato, isocyanato, thiocyanato, isothiocyanato, (meth)acryloyl, thio(meth) acryloyl, and/or episulfide radicals, and

b) at least one second polymerizable component further defined as:

i) thiophosphine monomers of formula:



(I)

wherein X represents –SH or  with R_1 being H or $-CH_3$, R and R' represent, independently from each other, an alkyl radical, an alkoxy radical or a phenyl radical which may be substituted with one or more alkyl and/or alkoxy groups, n is an integer from 0 to 4, n' is an integer from 0 to 5, x is an integer from 0 to 2 ; and y is an integer from 1 to 5 with the proviso that y + n is an integer from 1 to 5; or

ii) prepolymers resulting from the polymerization of at least one of said thiophosphine monomers of formula (I) and at least one of said first polymerizable component.

2. The polymerizable composition of claim 1, wherein the at least second polymerizable component is a prepolymer resulting from the polymerization of at least one of said thiophosphine monomers of formula (I) and at least one of said first polymerizable component, and having a number average molecular weight ranging from 1,000 to 10,000.

3. The polymerizable composition of claim 1, wherein y = 1.

4. The polymerizable composition of claim 1, wherein n and n' are equal to 0.

5. The polymerizable composition of claim 1, wherein X represents –SH.

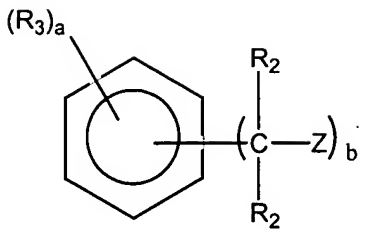
6. The polymerizable composition of claim 1, wherein the alkyl radicals and alkoxy radicals are respectively C_1-C_6 alkyl radicals and C_1-C_6 alkoxy radicals.

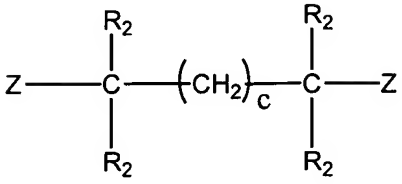
7. The polymerizable composition of claim 1, further comprising one or more additional polymerizable monomers different from first and second components.

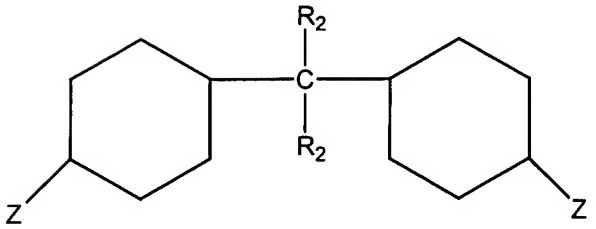
8. The polymerizable composition of claim 7, wherein the additional monomers are polythiols.

9. The polymerizable composition of claim 1, wherein the first polymerizable monomers are polycyanate, polyisocyanate, polythiocyanate, polyisothiocyanate, poly(meth)acrylate, polythio(meth)acrylate, and/or polyepisulfide monomers.

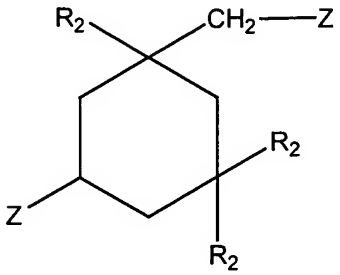
10. The polymerizable composition of claim 9, wherein the polyisocyanate and polyisothiocyanate monomers are monomers of formulae:







and



wherein:

R_2 is independently H or a C_1-C_5 alkyl group;

R_3 is H, a halogen or a C_1-C_5 alkyl group;

Z is –N=C=A where A is O or S ;

a is an integer ranging from 1 to 4, b is an integer ranging from 2 to 4 and $a+b \leq 6$; and

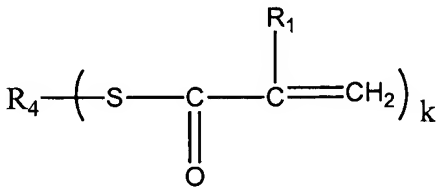
c is an integer from 1 to 10.

11. The polymerizable composition of claim 10, wherein c is an integer from 1 to 6.

12. The polymerizable composition of claim 10, wherein the polyisocyanate or isothiocyanate monomers are tolylene diisocyanate or diisothiocyanate, phenylene, diisocyanate or diisothiocyanate, ethylphenylene diisocyanate, isopropyl phenylene diisocyanate or diisothiocyanate, dimethylphenylene diisocyanate or diisothiocyanate, diethylphenylne diisocyanate or diisothiocyanate, trimethylbenzyl triisocyanate or triisothiocyanate, xylylene diisocyanate or diisothiocyanate, benzyl triiso(thio)cyanate, 4,4'-diphenyl methane diisocyanate or diisothiocyanate, napthalene diisocyanate or diisothiocyanate, isophorone diisocyanate or diisothiocyanate, bis(isocyanate or isothiocyanate methyl) cyclohexane, hexamethylene diisocyanate or diisothiocyanate, or dicyclohexylmethane diisocyanate or diisothiocyanate.

13. The polymerizable composition of claim 9, wherein the poly(meth)acrylate monomers are alkyleneglycol di(meth)acrylates, polyalkyleneglycol di(meth)acrylates, neopentylglycol di(meth)acrylate, or derivates of bisphenol-A di(meth)acrylates.

14. The polymerizable composition of claim 9, wherein the polythio(meth)acrylate monomers are the compounds of the formula:

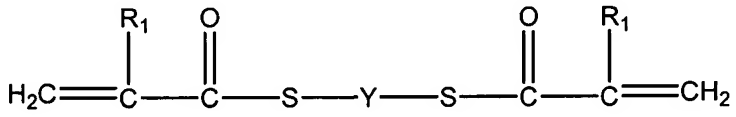


(II)

wherein R_4 is a linear or branched, polyvalent aliphatic hydrocarbon radical, or a polyvalent aromatic group, directly linked to the sulfur atom of the thio(meth)acrylate groups with an aromatic ring or by means of a linear alkyl chain, R_1 is hydrogen or $-CH_3$, and k is an integer from 2 to 6.

15. The polymerizable composition of claim 14, wherein R_4 is a radical comprising in its chain one or more -O-, -S-, and/or carbonyl group.

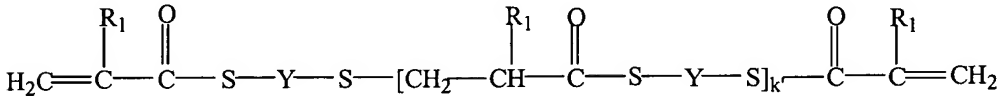
16. The polymerizable composition of claim 14, wherein the polythio(meth)acrylate monomers are monomers of the formula:



(III)

wherein Y is a linear or branched C_2-C_{12} alkylene group, a C_3-C_{12} cycloalkylene group, a C_6-C_{14} arylene group or a C_7-C_{26} alkarylene group, the carbon chains of Y can be interrupted by one or more oxygen and/or sulphur atoms and R_1 is hydrogen or a methyl group; and/or

monomers of the formula:



(IV)

wherein R_1 and Y are defined as above, and k' is an integer from 1 to 10.

17. The polymerizable composition of claim 1, wherein the prepolymers result from the polymerization of at least one of said thiophoshine monomer of formula (I) and at least one of said first polymerizable component further defined as a dicyanate, dithiocyanate, diisothiocyanate, diisocyanate, di(meth)acrylate, dithio(meth)acrylate or diepisulfide monomer.

18. The polymerizable composition of claim 8, wherein the polythiols are monomers of the formula $R''(SH)_{n''}$, wherein R'' is an aliphatic, aromatic or heterocyclic radical and n'' is an integer of 2 or more.

19. The polymerizable composition of claim 18, wherein the polythiols are ethyleneglycol bis(thioglycolate), trimethylolpropane tris(3-mercaptopropionate), pentaerythritol tetrakis thiopropionate (PETP), 4-mercaptomethyl-3,6-dithia-1,8-

octanedithiol (MDO), bis(2-mercaptoethyl)sulfide (DMDS) and/or pentaerythritol tetrakis thioglycolate (PETG).

20. The polymerizable composition of claim 1, wherein the thiosphosphine monomers represent 1 to 25% by weight based on the total weight of the polymerizable monomers present in the composition.

21. The polymerizable composition of claim 20, wherein the thiosphosphine monomers represent 1 to 10% by weight based on the total weight of the polymerizable monomers present in the composition.

22. The polymerizable composition of claim 1, wherein the first polymerizable monomers represent 25 to 70% by weight based on the total weight of the polymerizable monomers present in the composition.

23. The polymerizable composition of claim 22, wherein the first polymerizable monomers represent 30 to 50% by weight based on the total weight of the polymerizable monomers present in the composition.

24. The polymerizable composition of claim 1, wherein the prepolymers represent up to 40% by weight based on the total weight of the polymerizable monomers present in the composition.

25. The polymerizable composition of claim 7, wherein the additional polymerizable monomers represent 25 to 50% by weight based of the total weight of polymerizable monomers present in the composition.

26. The polymerizable composition of claim 1, wherein the composition is a thermal and/or UV curable composition.

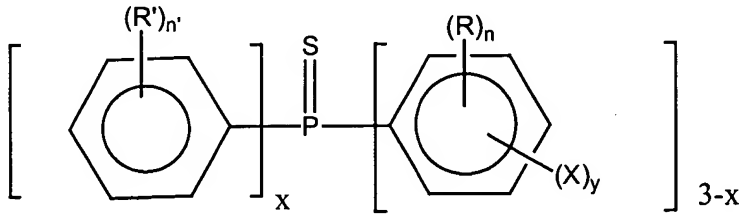
27. The polymerizable composition of claim 26, wherein the composition comprises at least one polymerization initiator further defined as a photoinitiator or a thermal initiator.

28. The polymerizable composition of claim 27, wherein the at least one polymerization initiator is further defined as a photoinitiator or a thermal initiator in a proportion of 0.001% to 5% by weight based on the total weight of the polymerizable monomers present in the composition.

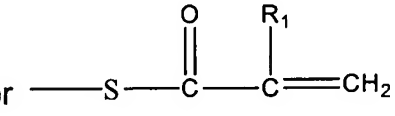
29. An article obtained by thermal and/or UV cure of a composition as set forth in claim 1.

30. The article of claim 29, further defined as an ophthalmic lens.

31. A thiosphosphine compound of formula:



(I)

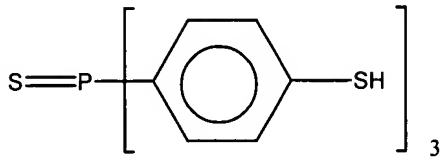
wherein X represents SH or  with R_1 being H or $-CH_3$, R and R' represent, independently from each other, an alkyl radical, an alkoxy radical, an aryl radical or a phenyl radical which may be substituted with one or more alkyl and/or alkoxy groups, n is an integer from 0 to 4, n' is an integer from 0 to 5, x is an integer from 0 to 2, y is an integer from 1 to 5 with the proviso that y + n is an integer from 1 to 5.

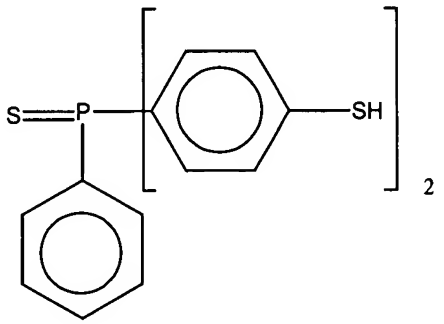
32. The thiophosphine compound of claim 31, wherein y = 1.

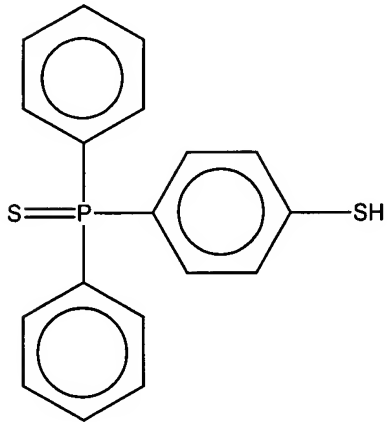
33. The thiophosphine compound of claim 31, wherein n and n' are equal to zero.

34. The thiophosphine compound of claim 31, wherein X represents —SH.

35. The thiophosphine compound of claim 34 having the formulae:

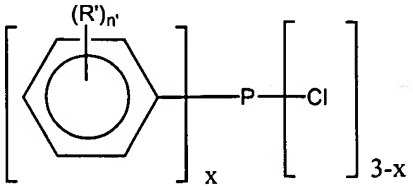






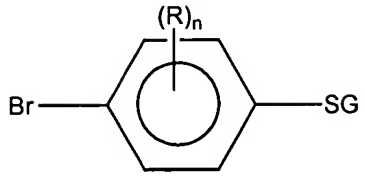
36. A process for making the thiophosphine compound of claim 31, wherein y = 1, X is in para position with regard to phosphorus and represents —SH, which comprises the following steps:

a) reacting in the presence of a catalyst a component A of formula:



(A)

in which R', n' and x are defined as in claim 31 with a component B of formula:



(B)

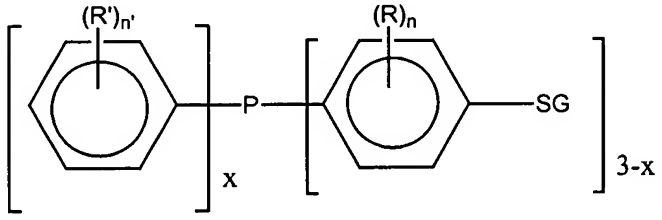
in which R and n are defined as in claim 31 and G is a blocking radical of the SH function, the molar ratio of components A to B being:

1/3 when x = 0

1/2 when x = 1, and

1/1 when x = 2;

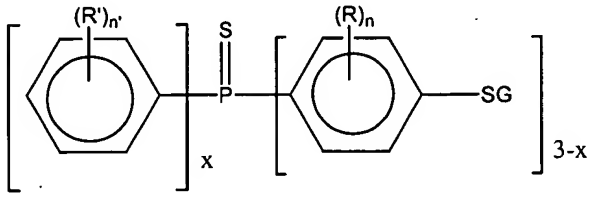
b) isolating from step a) a first intermediate compound C of formula :



(C)

c) reacting compound C with elemental sulphur;

d) isolating from step c) an intermediate compound D of formula:



(D) ;

e) reacting intermediate compound D with an alkaline thiolate in a solvent under reflux; and

f) isolating from step e) a thiophosphine monomer of formula (I).

37. The process of claim 36, wherein n = n' = 0.

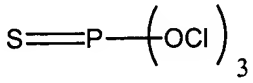
38. The process of claim 36, wherein G is CH_3.

39. The process of claim 36, wherein the thiolate is sodium 2-methyl-2-propane thiolate.

40. The process of claim 36, wherein the catalyst of step a) is n-butyl lithium.

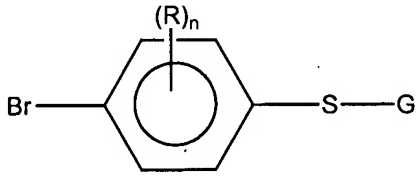
41. A process for making a thiophosphine monomer as set forth in claim 31, wherein x = 0, y = 1 and wherein X is in para position with regard to phosphorus and represents –SH, which comprises the following steps:

a) reacting in the presence of a catalyst, a component A' of formula:



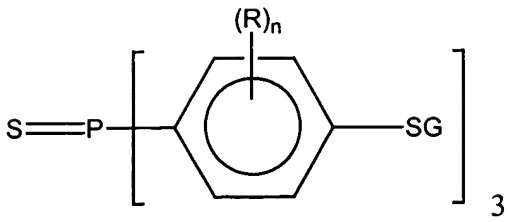
(A')

with a component B of formula:



in a molar ratio A'/B equal to 1/3, where R, n and G are defined as in claim 36;

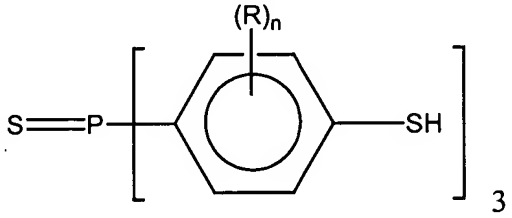
b) isolating from step a) an intermediate compound of formula D':



(D')

c) reacting intermediate compound D' with an alkaline thiolate in a solvent under reflux; and

d) isolating from step c) a thiophosphine monomer of formula:



where R and n are defined as in claim 31.

42. The process of claim 41, wherein n is zero.

43. The process of claim 41, wherein G is CH_3.

44. The process of claim 41, wherein the thiolate is sodium 2-methyl-2-propane thiolate.

45. The process of claim 41, wherein the catalyst is n-butyl lithium.

46. A prepolymer resulting from the polymerization of at least one thiosphosphine monomer as set forth in claim 1 and at least one first polymerizable component as set forth in claim 1 and having a number average molecular weight ranging from 1,000 to 10,000.

47. A prepolymer of claim 46, wherein first polymerizable components are dicyanate, dithiocyanate, diisocyanate, diisothiocyanate, di(meth)acrylate, dithio(meth)acrylate or diepisulfide monomers.